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NATIONAL REPORT FOR FINLAND
SEISMOLOGY AND PHYSICS OF THE EARTH'S INTERIOR
1960—1962

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Seismograph station network and instrumentation

The present instrumentation of the seismograph station network is presented in the Table 2 (page 3) and the magnification curves of the different instruments in Fig. 1 (page 2).

The present station network is as follows:

1. *Helsinki:* The station has been functioning more as a research station than as an ordinary station. The telerecording △-station network
   a. *Hyvinkää* (60.7°N, 24.8°E)
   b. *Porkkala* (60.0°N, 24.5°E)
   c. *Porvoo* (60.3°N, 25.9°E)

has been operating mostly in connection with research work only.

2. *Nurmijärvi:* World standard station since August 1962.

3. *Joensuu:* Recording has been discontinued since August 1961.

4. *Kajaani:* Because of the provisional housing and installation, the station has been operating with reduced activity only.

5. *Oulu:* Because of the housing problem and very great local disturbances, operation was discontinued at the end of 1960. The station's new location will be Kiiminki, 10 miles northeast of Oulu, where the University of Oulu has constructed an astronomical observatory, including seismograph vaults. The vaults are already completed and are only awaiting the installation of instruments.

6. *Sodankylä:* No changes regarding instrumentation.

7. *Kevo:* The station began operation September 1961. The station is located in the northernmost part of Finland, being part of the Subarctic Research Station of the University of Turku. World standard station since August 1962.

Macroseismic studies of the felt earthquakes

The following earthquakes were felt:

1. *February 2, 1960:* The epicentre was located in the U.S.S.R., 66°55.4′N, 31°16.2′E, according to microseismic investigations. H = 12—32—30. The maximal intensity felt in Finland was V. The earthquake was felt over an area of 18,000 sq. km. of Finnish territory.

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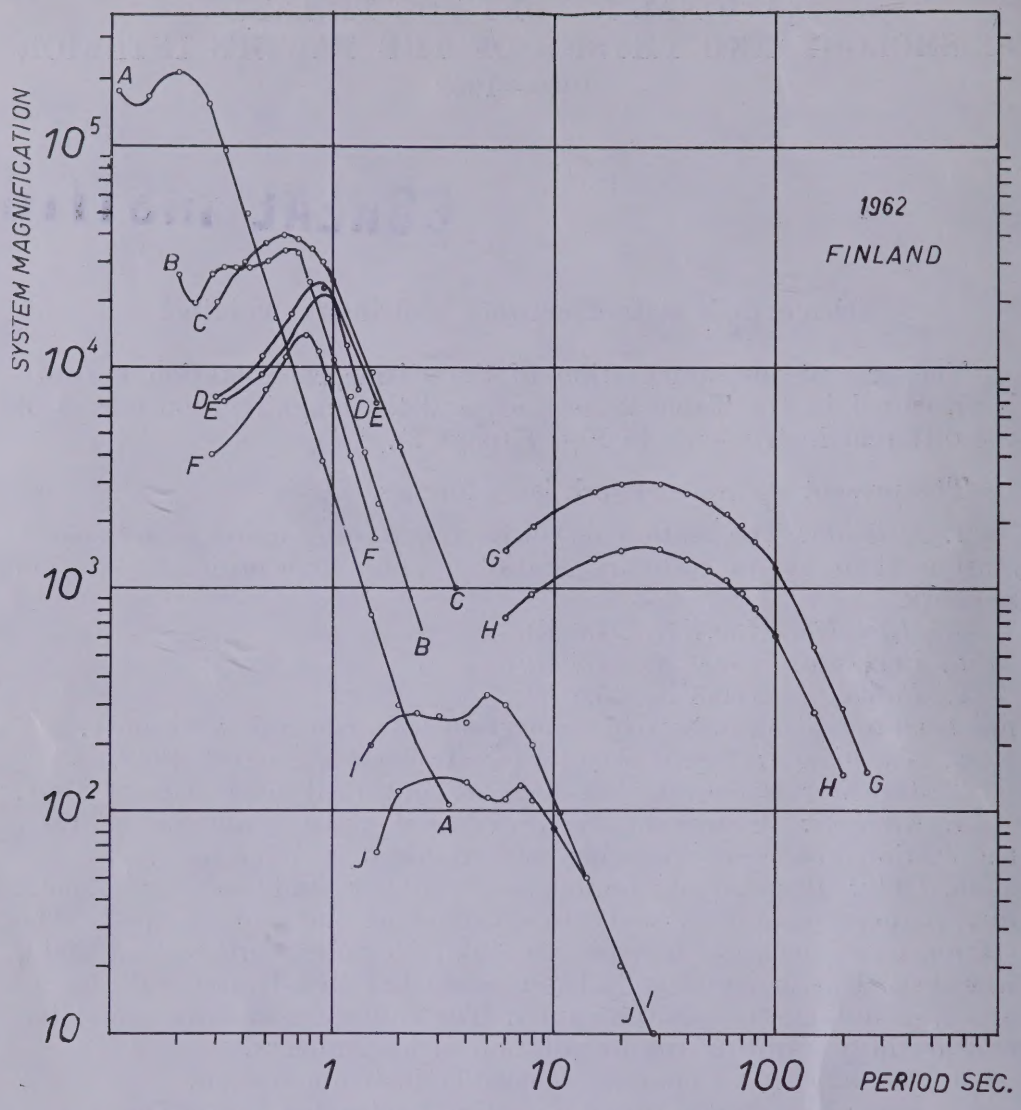

Fig. 1. The magnification curves of the different instruments

A—A	Nurmia (smoked pap.)	F—F	Willmore Z
B—B	Willmore (telerecord. system)	G—G	Sprengnether (*KEV*)
C—C	Benioff (*KEV & NUR*)	H—H	Sprengnether (*NUR*)
D—D	Willmore E	I—I	Mainka N
E—E	Willmore N	J—J	Mainka E

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Table 2. The present instrumentation of the seismograph station network. The station constants have been revised.

Station	Seismometer	Period sec. Seism.	Galv.	Magn.	Damp. ratio	Recording type	Drum speed	Grographical coordinates
HEL	Mainka E	10		200	3 :1	Smoked paper	22	60°10′32.3″N
	Mainka N	10		250	3 :1	Smoked paper	22	24°57′25.2″E
	Willmore Z	0.75		34.000	3.3:1	Ink record	120	h = 19.9 m
KEV	Sprengnether Z	30	100	1.500	17:1	Photo paper	30	69°45.4′N
	Sprengnether N	30	100	1.500	17:1	Photo paper	30	27°00.9′E
	Sprengnether E	30	100	1.500	17:1	Photo paper	30	h = 97.2 m
	Benioff Z	1.0	0.75	25.000	17:1	Photo paper	60	
	Benioff N	1.0	0.75	25.000	17:1	Photo paper	60	
	Benioff E	1.0	0.75	25.000	17:1	Photo paper	60	
	Nurmia Z	0.4		100.000	2:1	Smoked paper	60	
KJN	Willmore Z	1.0	1.5	15.000	3:1	Photo paper	60	64.1°N
	Willmore N	1.0	1.6	22.000	3:1	Photo paper	30	27.7°E
	Willmore E	1.0	1.5	25.000	3:1	Photo paper	30	h = 250 m
NUR	Sprengnether Z	30	100	3.000	17:1	Photo paper	30	60°30′32.2″N
	Sprengnether N	30	100	3.000	17:1	Photo paper	30	24°39′18.1″E
	Sprengnether E	30	100	3.000	17:1	Photo paper	30	h = 102 m
	Benioff Z	1.0	0.74	25.000	17:1	Photo paper	60	
	Benioff N	1.0	0.74	25.000	17:1	Photo paper	60	
	Benioff E	1.0	0.74	25.000	17:1	Photo paper	60	
	Nurmia Z	1.0	0.2	60.000	3:1	Smoked paper	60	
SOD	Benioff Z	1.0	0.2	34.000	15:1	Photo paper	60	67°22′16.2″N
	Nurmia N	0.5	1.1	35.000	3:1	Photo paper	30	26°37′44.7″E
	Nurmia E	0.5	1.1	35.000	3:1	Photo paper	30	h = 181 m
	Nurmia Z	0.5		100.000	2:1	Smoked paper	60	

2. *February 20, 1960:* The epicentre was located 66°35.1′N, 28°45.3′E, according to microseismic investigations. H = 00—52—50. The maximal intensity was VI and earthquake was felt over an area area of 14,000 sq. km.

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3. *March 3, 1960:* A weak tremor (III), lasting about 10 sec, was felt in Selkälä, Salla (66.6°N, 28.2′E) about 22.50 Finnish time. At the Sodankylä station: iP 20—52—55 (GMT).

4. *December 5, 1960:* A rolling noise (III), like a falling pile of firewood, was heard at Kurvinen, Kuusamo (66.5°N, 29.0°E) about 5.30 Finnish Time. The earthquake was recorded at Sodankylä: eP 03—19—27, iS 03—19—59 (GMT).

5. *January 28, 1961:* A weak tremor (III?) was felt at Väylänpää, Kolari (67.2°N, 24.0°E) at 12.30 Finnish time.

6. *February 17, 1961:* A rolling earthquake, like a heavy truck passing, was felt in Siikajoki and Tauvo (III—IV). According to the Finnish seismograph stations: 65.1°N, 23.9°E, H = 03—21—52 (GMT).

7. *March 10, 1961:* A light tremor (II—III), like a passing truck, shook the Sodakylä Observatory area (67.4°N, 26.5°E) at night 02.11 Finnish time. The tremor was felt by some observatory personnel who chanced to be awake. Weak record: eP 00—11—48 (GMT).

8. *March 21, 1961:* A light tremor (III?) rattled dishes and a low roll of sound was heard at Kivilahti, Kuusamo (66.2°N, 28.7°E) 13.19 Finnish time.

Research

Institute of Seismology, University of Helsinki, Helsinki

The main results of the research work during 1960—1962 are presented in the publications of the Institute listed on page 6. They maybe briefly summarized as follows:

a. Earthquake Seismology

Some results of surface wave studies have been published and the work is continuing. New travel time tables for near earthquakes in Finland have been calculated, using the results of explosion seismic studies. Besides, there are several other research projects still in progress: A study concerning the residuals O—C in ISS; studies of ice shocks recorded at Nurmijärvi station; etc.

b. Experimental Seismology

In the years 1960—1962 six field operations were carried out for continuation of the project begun in 1957. Three investigations were made in South and Southwest Finland, two in Central Finland and one in North Finland, where the Institute was assisting in an explosion seismic research project carried out by the Seismological Station of Bergen, Norway.

In the falls of 1961 and 1962 seismological stations in Finland recorded more than 20 nuclear explosions from the Novaya Zemlya area and four other nuclear explosions from USA and Algeria. Results are reported in the Progress Reports of the Institute for 1961 and 1962.

c. Instrumental Seismology

Two new versions of transistorized amplifiers have been developed. One is of the A. C. type utilizing well-known feed-back principles for

band width and stability, and is designed primarily for field experiments. The other is of the D. C. type and is chopper-stabilized. It is designed to serve as a universal amplifier and is dry cell- or mains-powered. These devices are completed with the new drum-type ink recorders.

The traditional method of obtaining the standard time from certain short-wave radio stations is abandoned in favor of certain stations in the VLF region, where the stability of propagation permits automation in reception.

A frequency-modulated telerecording seismograph and velocity-sensitive spot brightener have been designed and constructed.

Finnish Geodetic Institute, Helsinki

During the years 1924—1962 the Finnish Geodetic Institute has measured a network of gravity stations over the whole country. It contains about 12,000 stations. Up to the latitude of 64° the stations are equally distributed with 5 km spacing but north of this parallel there are still 20—40 km gaps between. The measurements for filling in these gaps are in progress. The results so far obtained have been published in three gravity anomaly maps on a scale of 1 : 1000 000, viz. Free Air, Bouguer and Isostatic Airy-Heiskanen T = 30 km anomalies.

Geological Survey of Finland, Helsinki

In the summer of 1961, the Geological Survey of Finland carried out a seismic survey of the Satakunta sandstone area in southwest Finland. The aim was to find out whether seismic measurements could be used in determining the depth of the Jotnian sandstone formation in Satakunta. Both refraction and reflection methods were used. One reflecting surface at a depth of 1,500 meters was observed and this surface may be the bottom of the sandstone formation. Seismic investigations in Satakunta were continued during the summer of 1962 and among other things the vertical velocity of seismic waves in the sandstone was determined by making measurements in a 600 m deep drill hole.

Institute of Marine Research, Helsinki

On Sääksjärvi (Nurmijärvi) special measurements of ice thickness were made along a line. In addition, the temperature of the ice at various layers was registered, and correlated with ice shocks recorded at Nurmijärvi seismograph station. The study is a joint research project with the Institute of Seismology, University of Helsinki. The work is continuing.

Department of Physics, University of Oulu

The Department of Physics, University of Oulu, has a seismograph station under construction at Kiiminki (65.1°N, 25.9°E) in connection with the astronomical observatory. The station will serve chiefly for research on weak local earthquakes. At first there will be only one instrument in operation, the Benioff-type vertical seismometer, designed and constructed at the workshop of the Department. The recording instrument is a helicorder with phototube amplifier (The Geotechnical Corp., Garland, Texas). Installation work is in progress.

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